Development of ex situ processed MgB_2 conductors

Keywords: low cost, light weight, Maglev, MRI

Hiroki Fujii
Electric and Electronic Materials Field / High-temperature Super conducting Wire Group
FUJII.Hiroki@nims.go.jp | https://samurai.nims.go.jp/profiles/fujii_hiroki?locale=en

Background

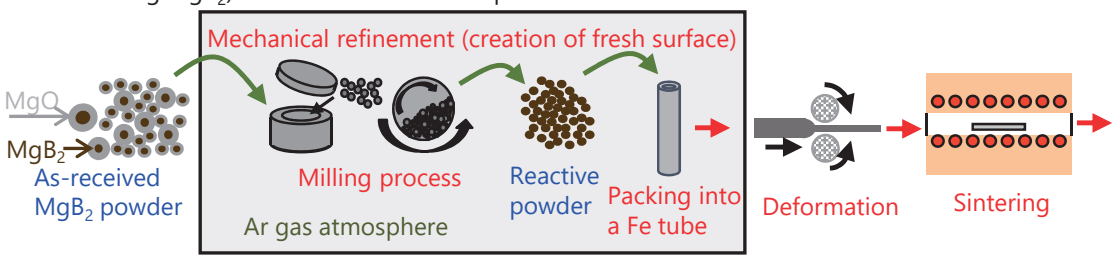
- The development of superconducting wires operated above 4.2 K is expected due to the recent increase of price of He.
- Light weight MgB_2 conductors are suitable to application for Maglev and hybrid aircraft instead of Nb–Ti and Nb_3Sn.

Aim

- Development of ex situ processed MgB_2 conductors with homogeneous and dense superconducting core.
- Application of light weight Al as a sheath by low sintering temperature process.
- Reduction of fabrication cost of MgB_2 conductors by simple process.

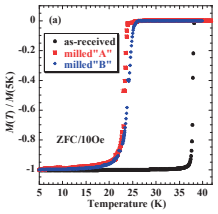
Advanced Research Topics

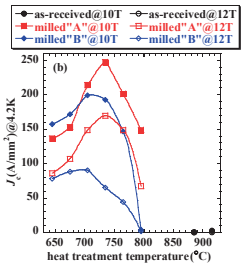
Fabrication of ex situ processed conductors using refined MgB_2 powders (removing layer of MgO surrounding MgB_2) under controlled atmosphere



Expected cross-section of conductors

J_c enhancement by improved grain connectivity





(a) Temperature-dependent magnetization curves and (b) transport J_c values at 4.2 K in 10 and 12 T as a function of sintering temperature for ex situ processed MgB_2 conductors using powders in as-received state and milled under conditions A and B.

Publications

- H. Fujii, A. Ishitoya, S. Itoh, K. Ozawa and H. Kitaguchi: Cryogenics 82 (2017) 15.
- H. Fujii, A. Iwanade, S. Kawada and H. Kitaguchi: Cryogenics 89 (2018) 76.

Applied area and future prospects

- Maglev
- MRI
- Application around 20 K using cryocooled system

Issues for technology transfer

- Further J_c enhancement
- Further sintering temperature reduction
- Suppression of T_c reduction